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Revision of the Major in Physics

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SUNY BROCKPORT

College Senate
State University of New York College at Brockport
350 New Campus Drive
Brockport, NY 14420-2925
(585) 395-2586 (Fax) 395-2246

Resolution # **23**


2007-2008

COLLEGE SENATE

New Resolution: ☒
Supersedes Res #: _____

TO: Dr. John R. Halstead, College President

FROM: The College Senate: *April 7, 2008*

RE:  I. Formal Resolution (*Act of Determination*)
II. Recommendation (*Urging the Fitness of*)
III. Other, For Your Information (*Notice, Request, Report, etc.*)

RECEIVED

APR 1 2008

SUNY BROCKPORT
PRESIDENT'S OFFICE

SUBJ: *Revision of the Major in Physics* routing #29 07-08 UC

Signed: 
(P. Gibson Ralph, 2007-2008 College Senate President)

Date: *11 APR 08*

Please fill out the bottom portion and follow the distribution instructions at the end of this page.

TO: P. Gibson Ralph, The College Senate President

FROM: *John R. Halstead, College President*

RE:  I. Decision and Action Taken on Formal Resolution (circle choice)

a. Accepted

Implementation Effective Date: Fall 2008


b. Deferred for discussion with the Faculty Senate on ____/____/____

c. Unacceptable for the reasons contained in the attached explanation

II, III. Response to Recommendation or Other/FYI

a. Received and acknowledged ____/____/____

b. Comment: _____

Signed: 
(Dr. John R. Halstead, President, SUNY College at Brockport)

Date: *4/22/08*

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**COLLEGE SENATE OFFICE
RESOLUTION PROPOSAL COVER PAGE**

**Routing Number	#29 07-08 UC
Replaces Resolution	#

****Routing # assigned by Senate Office**

DEADLINE FOR SUBMISSIONS: FEBRUARY 28

Incomplete proposals or proposals received after the deadline may not be reviewed until next semester.

INSTRUCTIONS – please, no multiple attachments – each proposal must be submitted as one document:

- Submit only complete proposals. Include support letters from department chair and dean.
- Proposals must be prepared individually in Word format using committee guidelines (guidelines online).
- Fill out this cover page for each proposal and insert it electronically as the front page of your document. (available online at www.brockport.edu/collegesenate)
- Email whole proposal with cover page as one attachment to senate@brockport.edu and facprez@brockport.edu.
- All updates must be resubmitted to the Senate office with the original cover page including routing number.
- Questions? Call the Senate office at 395-2586 or the appropriate committee chairperson.

1. **PROPOSAL TITLE:** Please be somewhat descriptive, i.e. *Graduate Probation/Dismissal Proposal* rather than *Graduate Proposal*.

Revision of the Major in Physics

2. BRIEF DESCRIPTION OF PROPOSAL:

In order to more effectively prepare students majoring in physics for the requirements they face as graduate students, employees in private and public sector research and development, and secondary school physics teachers, we propose to undertake a thorough revision of the Physics major curriculum. This proposal includes a 3 credit increase in upper-division physics, shifts some mathematics toward computational applications, and increases the emphasis on research-related activities. The new major is in line with those at Brockport's peer institutions.

3. ANTICIPATED EFFECTIVE DATE:

Fall Semester 2008

4. SUBMISSION & REVISION DATES: PLEASE PUT A DATE ON ALL UPDATED DOCUMENTS TO AVOID CONFUSION.

<i>First Submission</i>	<i>Updated on</i>	<i>Updated on</i>	<i>Updated on</i>

5. SUBMITTED BY: (contact person)

<i>Name</i>	<i>Department</i>	<i>Phone</i>	<i>Email</i>
Stanley F. Radford	Physics	395-5576	sradford@brockport.edu

6. COMMITTEES TO COPY: (Senate office use only)

Standing Committee	Forwarded To	Date
___ Enrollment Planning & Policies	To Committee for approval	2/28/08
___ Faculty & Professional Staff Policies	Committee Chair Sign Here When Passed	
___ General Education & Curriculum Policies *	To Executive Committee	3/10/08
___ Graduate Curriculum & Policies	GED to Vice Provost	Na
___ Student Policies	To Senate	3/24/08 – vote 4/7/08
___ Undergraduate Curriculum & Policies	To College President	4/11/08
* follow special Gen Ed procedures for submission of General Education proposals at "How to Submit Proposals" on our Website.		REJECTED -WITHDRAWN

****Use routing number and title in all reference to this proposal.**

Table 1: Side-by-side comparison of previous and proposed Physics major

Previous Physics Major Curriculum		
Number	Course Title	Cr.
PHS 201	College Physics I (with laboratory)	4
PHS 202	College Physics II (with laboratory)	4
PHS 300	Classical Physics	3
PHS 303	Classical Physics Laboratory	1
PHS 318	Modern Physics Laboratory	1
PHS 317	Modern Physics	3
PHS 301	Mathematical Methods of Physics	3
PHS 408	Physical Methods Laboratory I	1
PHS 409	Physical Methods Laboratory II	1
PHS 302	Classical Mechanics	3
various	Physics 300/400 level elective	3
PHS 320	Electricity and Magnetism	3
PHS 411	Quantum Mechanics	3
PHS 400	Physics Seminar I	1
PHS 401	Physics Seminar II	1
Total Physics credit hours:		35
Supporting Courses		
MTH 201	Calculus I	3
MTH 202	Calculus II	3
MTH 203	Calculus III	3
MTH 255	Ordinary Differential Equations	3
MTH 456	Advanced Differential Equations	3
CHM 205	College Chemistry I	4
CHM 206	College Chemistry II	4
CSC 203	Fundamentals of Computer Science I	4
Total credit hours, previous Physics Major:		62

Revised Physics Major Curriculum		
Number	Course Title	Cr.
PHS 235	Physics I	4
PHS 240	Physics II	4
PHS 307	Physics III	3
PHS 325	Intermediate Physics Laboratory	2
PHS 328	Modern Physics	3
PHS 332	Mathematical Methods of Physics	3
PHS 345	Advanced Physics Laboratory I	1
PHS 350	Advanced Physics Laboratory II	1
PHS 353	Classical Mechanics	3
PHS 361	Special Topics in Physics	3
PHS 368	Electricity and Magnetism	3
PHS 411	Quantum Mechanics	3
PHS 426	Advanced Theoretical Physics	3
PHS 403	Physics Project Seminar I	1
PHS 404	Physics Project Seminar II	1
Total Physics credit hours:		38
Supporting Courses		
MTH 201	Calculus I	4
MTH 202	Calculus II	4
MTH 203	Calculus III	4
MTH 255	Ordinary Differential Equations	3
CHM 205	College Chemistry I	4
CHM 206	College Chemistry II	4
CPS 201	Computational Tools I	3
CPS 202, or CSC 203	Computational Tools II (3 cr.), or Fundamentals of Computer Science I (4 cr.)	3/4
Total credit hours, revised Physics Major:		67/68

Bold text indicates a new course or a change in requirement.

Rationale for Physics Major curricular changes

The Department of Physics at Brockport serves three types of major students: those preparing for graduate school, those interested in entry-level technical positions in the private or public sectors, and those preparing to teach in secondary schools. Finding an appropriate balance of courses to serve these three groups of students is somewhat challenging. In a small department we cannot offer multiple tracks, so we attempt to have one track that fits all needs. To this end, we have considered the needs of our students and have concluded that a restructuring of the major is required.

At the same time, we have “cleaned up” our course offerings by removing courses that have not been taught for many years, and have rationalized the course naming and numbering scheme across our course offerings. A prime example of the need for this “clean-up” is the dropping of the names “General Physics” and “College Physics” in favor of “Introduction to Physics” and “Physics” respectively. This change is necessitated by the confusing fact that the Brockport naming – General Physics = algebra-based physics and College Physics = calculus-based physics – is exactly the reverse of the usage in almost the entire rest of the Physics education universe. This has proven to be confusing to students (particularly those transferring in or out), registrars, and various physics faculty members. The proposed numbering scheme is intended to re-establish the appropriate hierarchy among our courses and to create a comprehensive rule which will allow the addition/replacement of courses in the future. In brief, courses which are taught in the Fall semester (or Fall and Spring semesters) have odd numbers, courses taught only in the Spring semester have even numbers, and courses with laboratory content have numbers which are multiples of 5.

A side-by-side comparison of the previous and proposed majors is provided in Table 1.

These changes, taken as a whole, will position Brockport Physics to be competitive with our “peer” institutions as illustrated in Appendix A.

Letters from the Dean and Chairs of affected Departments are presented in Appendix B.

Key modifications:

1. We have broadened the available topical areas of study by requiring that students take at least one “Special Topics in Physics” (PHS 361) course as part of their major. Currently planned topics, which will be taught regularly, are “Condensed Matter Physics” and “Astrophysics.” We believe this change will be beneficial for all of our students.

2. While we are unable to offer two semesters of the “big three” subject areas – Classical Mechanics, Electricity and Magnetism, and Quantum Mechanics – as many departments do, we have opted to combine those subjects in a one semester course “Advanced Theoretical Physics” (PHS 426).

Both Items 1 and 2 will better prepare our students for graduate school while broadening the exposure of all our students to additional areas of 21st Century physics.

3. Following the trend in Physics undergraduate education toward more student research-type classes, we have modified our advanced laboratory (PHS 345 and 350) and seminar (PHS 403 and 404) courses to provide research project orientation.

4. While we continue to require 15 hours of Mathematics, we have shifted some of our mathematical training into the computational realm. We will no longer require MTH 456 Advanced Differential Equations. We will require 6 or 7 credits of computer-based course work [CPS 201 (3 Cr) and CPS 202 (3 Cr) or CSC 203 (4 Cr)]. This represents an increase of 3 (or 4) credits, and should help prepare students for the realities of graduate school and technical employment, while broadening the skills of our teacher education students.

Description of new courses

We will be introducing three new courses.

PHS 325 Intermediate Physics Laboratory (A). *Corequisite: PHS 307.* Allows students to perform experiments with mechanical and electrical oscillators, Fourier series, statistical mechanics, and the wave properties of sound and light. Provides an introduction to methods of data analysis, such as curve fitting and error propagation. One hour of lecture and three hours of lab per week. 2 Cr. Fall.

This course replaces the old PHS 303 Classical Physics Laboratory and PHS 318 Modern Physics Laboratory which were 1 Cr each.

PHS 361 Special Topics in Physics (A). *Prerequisites: PHS 328 and PHS 332, or permission of instructor.* Provides an intermediate-level introduction to selected areas of physics. Possible topics include Condensed Matter Physics, Astrophysics, and others. May be taken only once for major credit. Three hours of lecture per week. 3 Cr. Fall.

Descriptions of the Astrophysics and Condensed Matter offerings are given below.

Astrophysics. The application of physics to the study of stars, galaxies, and cosmology. Topics include the properties of stars, stellar structure and evolution, the nature of our Milky Way Galaxy, and the structure and evolution of the Universe.

Condensed Matter Physics. Provides an introduction to the principles of condensed matter physics. Covers topics including crystal structure, the free electron model in solids (metals and semiconductors), band theory, magnetism, and super conductivity.

PHS 426 Advanced Theoretical Physics (A). *Prerequisites: PHS 353, PHS 368, and PHS 411.* Explores topics in classical mechanics, electrodynamics, and quantum mechanics beyond those covered in previous classes. Three hours of lecture per week. *3 Cr. Spring.*

Staffing Issues

All of the courses offered by the Physics Department in the new program can and will be taught by a combination of full-time and adjunct faculty. This being said, the Physics faculty will continue to be stretched quite thinly.

Resources and facilities needed to implement this program

We do not anticipate needing any resources or facilities beyond those already available. Updating of laboratory equipment will be carried out incrementally as funds become available.

Appendix A: Comparison of Selected Peer Institutions

Comparison of Mathematics, Computer or Computational Science, and total Major credit requirements at selected peer institutions.

Peer Institution	Math Requirements			Required Computer Science Cr.	Credits Required for Major
	Calculus	Differential Equations	Additional Required Courses		
Bridgewater State College	I, II, III	Y	None	3	56
Univ. of Mass. Dartmouth	I, II, III	Y	None	3	63
CUNY City College	I, II	Y	Linear Algebra & Vector Analysis	0	58
SUNY College at New Paltz	I, II	N	Applied Math I, II	0	60
SUNY College at Oswego	I, II, III	Optional	None	3	74/77
Bloomsburg Univ. of PA	I, II, III	Y	None	3	71
Shippensburg Univ. of PA	I, II, III	Y	Linear Algebra	3	65
Rowan University	I, II, III	Y	None	0	60/62
College of New Jersey	I, II	Y	None	3	69
Marietta College	I, II, III	Y	None	3	58
SUNY College at Cortland	I, II, III	Y	Linear Algebra, Applied Math	3	69
SUNY College at Fredonia	I, II, III	Y	None	0	54
SUNY College at Geneseo	I, II, III	Y	None	6	66
SUNY College at Plattsburgh (B.A. only)	I, II, III	Y	None	3	56/58
SUNY College at Brockport	I, II, III	Y	None	6/7	67/68

Appendix B: Letters from the Dean and Chairs of affected departments

Subject: RE: Physics curriculum changes
From: Stuart Appelle <sappelle@brockport.edu>
Date: Thursday, February 21, 2008 12:44 pm
To: sradford@brockport.edu

Stanley:

Contingent on support from "affected" departments, I approve the proposed changes specified below.

Stuart Appelle, Ph.D.
Dean, School of Letters and Sciences
The College at Brockport

Stuart,

As we discussed, the Department of Physics is going forward with a major curriculum revision. I have attached the new catalog copy, which describes the revised program, and the course descriptions. I am writing to ask you to provide me with a letter (or email) of support.

Just so that you are aware, some of the changes affect other Departments. We discussed these changes when we met February 5th.

1. We are increasing the major requirement for computer-based classes according to the following table:

Old	New
CSC 203 Fund of Comp Sci I	CPS 201 Computational Tools I and CSC 203 Fund Comp Sci I or CPS 202 Computational Tools II.

2. We no longer intend to offer either algebra-based or calculus-based introductory physics without lab. This change should have minimal impact (2 -3 students per year at most).
3. We are dropping the major requirement for MTH 456 Advanced Differential Equations. This keeps our Mathematics requirement at 15 credits (due to the addition of 1 credit each to MTH 201, 202, and 203). MTH 324 Linear Algebra and MTH 426 will still be recommended for students going on the graduate school.

I will be requesting letters of support (or non-opposition at least) from the Chairs of the Departments of Computational Science, Computer Science, and Mathematics.

I would be happy to meet with you again to discuss these changes.

Regards,
Stanley F. Radford, Ph.D.
Professor and Chair
Department of Physics
SUNY Brockport

Subject: Re: Physics curriculum changes
From: rtuzun@brockport.edu
Date: Sunday, February 17, 2008 2:27 pm
To: sradford@brockport.edu

Stan,

The Department of Computational Science supports the proposed revised Physics curriculum. We believe that the proposed changes will prove beneficial to students. In addition, the Computational Science department will be able to accommodate the increased number of students.

Bob

Robert E. Tuzun,
Associate Professor and Chair
Department of Computational Science
SUNY Brockport
Subject: Re: Physics curriculum
From: mbarbosu@brockport.edu
Date: Friday, February 22, 2008 6:04 pm
To: sradford@brockport.edu

Hi Stan,

I want to confirm that dropping of MTH 456 from the required list of courses for the Physics major will not affect the Mathematics Department's ability to deliver the class.

Have a nice weekend,
Michael

Dr. Mihail Barbosu, Chair
Department of Mathematics
State University of New York at Brockport

From: Kad Lakshmanan
Date: Wednesday, February 20, 2008 2:10 pm
Subject: Re: Fwd: Physics curriculum changes
To: sradford@brockport.edu

> Stanley

>

> Thank you for letting me know of your plans to revise the Physics curriculum. I am not sure you need a letter of support from me for dropping/replacing a computer science course from your program. I can see the need if you are adding a course taught by us.

>

...

> Kad Lakshmanan, Computer Science

From: Peter Veronesi
Date: Tuesday, February 26, 2008 7:48 pm
Subject: Re:new sheets
To: sradford@brockport.edu

Looks good to me then. pv

Dr. Peter Veronesi
Associate Professor of Science Education

On Feb 26, 2008, at 4:06 PM, sradford@brockport.edu wrote:
Peter and Nancy,

I don't think that students would have to be here longer than before. The "new" course is a senior-level course taught in the Spring, and there has always been such a course (it used to be the Quantum Mechanics course). As for the CPS pre-requisite, we formerly required CSC 203 which had the same sort of prerequisite. Note that the 2nd CPS or CSC course is "replacing" MTH 456 which is no longer required - thus students will also not have to take the prerequisite(s) for MTH 456 (MTH 281 and MTH 324).

I hope this helps.

SFR

Stanley F. Radford, Ph.D.
Professor and Chair
Department of Physics

> From: Peter Veronesi
> Date: Tuesday, February 26, 2008 3:40 pm
> Subject: new sheets
> To: sradford@brockport.edu
> Cc: Nancy dipasquale
>
> Hi Stanley,
> Nancy DiPasquale Looked over the sheets while I was out today. While she didn't see a problem with anything, she did notice that you have one additional course and students would be here longer. She also noticed that at least one of the CMST courses needed a pre-req. We would need a lot more time to see if there was going to be difficulting in weaving inwith our courses for teacher cert. For example, the teacher candidates need 150 hours of field experience during the week, which is always a challenge to fit in when they have classes to take here. hope this helps and Kudos to Nancy! pv
>
>
>
>Dr. Peter Veronesi
>Associate Professor of Science Education